

# CONSEQUENCES OF BIOLOGICAL INVASIONS/ TOPICS OF BIOLOGICAL INVASIONS

ALS 4162/6935

3 CREDITS

SPRING 2023

## INSTRUCTOR INFORMATION

### Instructor

**Dr. Tolulope Agunbiade**

### Contact Information & Hours

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### Teaching Assistant

**Alex Orfinger**

### Contact Information & Hours

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### Teaching Assistant

**Sara Salgado Astudillo**

### Contact Information & Hours

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Office hours: Wednesdays 1PM

## GENERAL INFORMATION

### Course Description

This course provides an overview of non-native species invasions and the environmental effects of these invaders. Students will acquire a working knowledge of important global invaders and develop critical thinking skills for assessing the consequences of biological invasions. This course is oriented toward students majoring in Environmental Management or related disciplines.

### Purpose of Course

“The invasion of non-native species into new ecosystems is accelerating as the world’s human population multiplies and goods are transported ever more rapidly on an increasing global scale. The impact of invasive species is second only to that of human population growth and associated activities as a cause of the loss of biodiversity throughout the world” (Pimentel 2011). In this course, a number of important invasive species representing a range of taxa will be examined from a global perspective.

### Learning Goals and Objectives

The goal of the course is to instill an appreciation of the global economic costs and environmental impacts of biological invasions.

After completing this course, students will be able to:

- describe the principles and basic practices of pest exclusion, eradication, and management tactics for biological invaders from six continents;
- assimilate information on biological invaders and identify general trends from case study examples.

### Prerequisite

Integrated Principles of Biology 1 and Laboratory (BSC 2010 and 2010L), and Integrated Principles of Biology 2 and Laboratory (BSC 2011 and 2011L) or equivalent.

### Course Website

The course content, including narrated lectures, assigned readings, examinations, quizzes, discussions and assignments will be available through the course website in Canvas at <https://elearning.ufl.edu/>. Each week, students are required to view the narrated lectures and associated readings, participate in the discussions, and take the assignments, quizzes and examinations prior to the assigned due dates in order to complete the course requirements. Weekly modules will be available by 8:00 am on Monday of the module week.

### Course Communications

In addition to the assigned discussion assignments, students are encouraged to post general questions on topics taught in the class under the General Questions thread. The instructor and/or the Teaching Assistant (TA) will respond to the questions. Other students are also encouraged to respond to the questions. Private questions should be sent to the instructor via e-mail. Students will be notified by Canvas e-mail if instructor or TAs will be unavailable for office hours.

## COURSE MATERIALS

### Textbooks/Readings

The following textbooks are required for this course:

- Biological Invasions: Economic and Environmental Costs of Alien Plant, Animal and Microbe Species, David Pimentel (ed.), 2002, ISBN# 0-8493-0836-4, CRC Press. This book can be purchased at the UF bookstore, or through various online vendors. eBook also available at <http://site.ebrary.com/lib/univflorida/docDetail.action?docID=10143770>
- Biological Invasions: Economic and Environmental Costs of Alien Plant, Animal and Microbe Species, 2<sup>nd</sup> Edition. David Pimentel (ed.), 2011, ISBN# 978-1-4398-2990-5, CRC Press. This book can be purchased at the UF bookstore, through various online vendors, or is available as an eBook at <http://site.ebrary.com/lib/univflorida/docDetail.action?docID=10473079> (Note: In order to access the free ebooks of David Pimentel's two editions of Biological Invasions, students need to be on VPN, VDI, or using a UF computer. See below.)  
Go to <https://vpn.ufl.edu/+CSCOE+/logon.html> and login OR  
Go to <https://vdi.ifas.ufl.edu/portal/webclient/index.html#/>
- Invasive & Introduced Plants and Animals: Human Perceptions, Attitudes and Approaches to Management. Ian D. Rotherham & Robert A Lambert (eds.), 2011, ISBN# 978-1-84971-071- 8, Earthscan Ltd, London. This book can be purchased

at the UF bookstore, through various online vendors, or is available as an eBook at <http://lib.myilibrary.com/ProductDetail.aspx?id=419980>

Additional Resources:

1. <https://www.freshfromflorida.com/Divisions-Offices/Florida-Forest-Service/Our-Forests/Forest-Health/Invasive-Non-Native-Plants/Invasive-Non-native-Plant-Links>
2. <http://edis.ifas.ufl.edu/>
3. <http://www.invasive.org/>
4. <http://www.fleppc.org/index.cfm>
5. <http://tncinvasives.ucdavis.edu/>
6. <http://www.iucngisd.org/gisd/>
7. <http://www.invasivespeciesinfo.gov/>

## COURSE SCHEDULE

Week/Dates	Topic	Reading	Tasks/Assessments
1	<p><b>Module 1 - Course Introduction, World Overview of Invasive Species</b></p> <ul style="list-style-type: none"> <li>• Course Introduction</li> <li>• Navigating Canvas</li> <li>• Review of Syllabus</li> <li>• Honor Code</li> <li>• The Importance of Invasive Species to Florida’s Natural Areas</li> <li>• Introduction: Non-native Species in the World</li> </ul>	<ul style="list-style-type: none"> <li>• Pimentel Chapter 1, 2<sup>nd</sup> edition</li> </ul>	<ul style="list-style-type: none"> <li>• Practice navigating Canvas</li> <li>• Quiz 1</li> </ul>
2	<p><b>Module 2 - Invasive Species of Australian Continent: Weeds and Vertebrates</b></p> <ul style="list-style-type: none"> <li>• The Impacts of Alien Plants in Australia</li> <li>• Environmental and Economic Costs of Invertebrate Invasions in Australia</li> </ul>	<ul style="list-style-type: none"> <li>• Pimentel Chapters 2 and 3, 2<sup>nd</sup> edition</li> </ul>	<ul style="list-style-type: none"> <li>• Discussion 1: Cactus Moth</li> <li>• Quiz 2</li> </ul>
3	<p><b>Module 3 - Invasive Species of Australian Continent: Australian Vertebrates and Weeds in New Zealand</b></p> <ul style="list-style-type: none"> <li>• Non-Indigenous Vertebrates in Australia</li> </ul>	<ul style="list-style-type: none"> <li>• Pimentel Chapter 3, 1<sup>st</sup> edition</li> <li>• Pimentel Chapter 12, 2<sup>nd</sup> edition</li> </ul>	<ul style="list-style-type: none"> <li>• Discussion 2: Rabbits in Australia</li> <li>• Quiz 3</li> </ul>

	<ul style="list-style-type: none"> <li>Economic Impacts of Alien Plants in New Zealand: Some Examples</li> </ul>		
4	<p><b>Module 4 - Invasive Species of Australian Continent: Invertebrates in New Zealand</b></p> <ul style="list-style-type: none"> <li>Alien Invertebrates in New Zealand</li> <li>Ecological and Economic Costs of Alien Vertebrates in New Zealand</li> </ul>	<ul style="list-style-type: none"> <li>Pimentel Chapter 12, 1<sup>st</sup> edition</li> <li>Pimentel Chapter 13, 2<sup>nd</sup> edition</li> </ul>	<ul style="list-style-type: none"> <li>Discussion 3: New Zealand</li> <li>Quiz 4</li> </ul>
5	<p><b>Module 5 - British Isles and Europe: British Weeds, Arthropods, and Plant Pathogens</b></p> <ul style="list-style-type: none"> <li>Alien Plants in Britain</li> <li>Non-native Invasive Species of Arthropods and Plant Pathogens in the British Isles</li> </ul>	<ul style="list-style-type: none"> <li>Pimentel Chapter 5, 2<sup>nd</sup> edition</li> <li>Pimentel Chapter 8, 1<sup>st</sup> edition</li> </ul>	<ul style="list-style-type: none"> <li>Discussion 4: Potato Late Blight</li> <li>Quiz 5</li> <li>Exam 1 (Modules 1 - 4)</li> </ul>
6	<p><b>Module 6 - British Isles and Europe: British Alien Vertebrates and European Plant Pathogens</b></p> <ul style="list-style-type: none"> <li>Economic, Environmental and Social Dimensions of Alien Vertebrate Species in Britain</li> <li>Invasive Plant Pathogens in Europe</li> </ul>	<ul style="list-style-type: none"> <li>Pimentel Chapter 6, 2<sup>nd</sup> edition</li> <li>Pimentel Chapter 9, 2<sup>nd</sup> edition</li> </ul>	<ul style="list-style-type: none"> <li>Discussion 5: Wild Boar</li> <li>Quiz 6</li> </ul>
7	<p><b>Module 7 - British Isles and Europe: European Invertebrates and Vertebrates</b></p> <ul style="list-style-type: none"> <li>Invasive Patterns of Alien Terrestrial Invertebrates in Europe</li> <li>Impacts of Alien Vertebrates in Europe</li> </ul>	<ul style="list-style-type: none"> <li>Pimentel Chapter 8, 2<sup>nd</sup> edition</li> <li>Pimentel Chapter 7, 2<sup>nd</sup> edition</li> </ul>	<ul style="list-style-type: none"> <li>Discussion 6: The European Union</li> <li>Quiz 7</li> </ul>
8	<p><b>Module 8 - South America, India and Weed Risk Assessment: Brazilian Plant Pathogens and Vertebrates</b></p> <ul style="list-style-type: none"> <li>Alien Plant Pathogens in Brazil</li> </ul>	<ul style="list-style-type: none"> <li>Pimentel Chapter 5, 1<sup>st</sup> edition</li> </ul>	<ul style="list-style-type: none"> <li>Discussion 7: Eastern Brazil</li> <li>Quiz 8</li> </ul>

	<ul style="list-style-type: none"> <li>Invasive Vertebrates in Brazil</li> </ul>	<ul style="list-style-type: none"> <li>Pimentel Chapter 4, 2<sup>nd</sup> edition</li> </ul>	
9	<p><b>Module 9 - Indian Weed and Plant Pathogens</b></p> <ul style="list-style-type: none"> <li>Invasive Plants in the Indian Subcontinent</li> <li>Alien Plant Pathogens in India</li> </ul>	<ul style="list-style-type: none"> <li>Pimentel Chapter 10, 2<sup>nd</sup> edition</li> <li>Pimentel Chapter 9, 1<sup>st</sup> edition</li> </ul>	<ul style="list-style-type: none"> <li>Discussion 8: <i>Jatropha curcas</i></li> <li>Quiz 9</li> <li>Exam2 (Modules 5 – 8)</li> </ul>
10	<p><b>Module 10 - South America, India, and Weed Risk Assessment: Indian Invertebrates and IFAS Weed Risk Assessment</b></p> <ul style="list-style-type: none"> <li>Invasive Invertebrates in India: Economic Implications</li> <li>The IFAS Assessment of Non-Native Plants in Florida's Natural Areas</li> </ul>	<ul style="list-style-type: none"> <li>Pimentel Chapter 11, 2<sup>nd</sup> edition</li> <li>EDIS #SS-AGR- 371</li> </ul>	<ul style="list-style-type: none"> <li>Discussion 9: The Golden Apple Snail</li> <li>Quiz 10</li> </ul>
11	<p><b>Module 11 - Africa, US, and World: South African Weeds and Invertebrates</b></p> <ul style="list-style-type: none"> <li>Invasive Plants in the Indian Subcontinent</li> <li>Economic Consequences of the Environmental Impacts of Alien Plant Invasions in South Africa</li> <li>Impact of Non-native Invertebrates in South Africa</li> </ul>	<ul style="list-style-type: none"> <li>Pimentel Chapter 14, 2<sup>nd</sup> edition</li> <li>Pimentel Chapter 15, 1<sup>st</sup> edition</li> <li>Rotherham and Lambert Chapter 22</li> </ul>	<ul style="list-style-type: none"> <li>Discussion 10: Working for Water</li> <li>Quiz 11</li> <li>Exam3 (modules 9 -11)</li> <li>Turn in Weed Risk Assessment report (all students)</li> </ul>
12	<p><b>Module 12 - Africa, US, and World: South Africa Vertebrates and US Invasive Species</b></p> <ul style="list-style-type: none"> <li>Invasive Vertebrates of South Africa</li> <li>Environmental and Economic Costs Associated with Alien Invasive Species in the United States</li> </ul>	<ul style="list-style-type: none"> <li>Pimentel Chapter 15, 2<sup>nd</sup> edition</li> <li>Pimentel Chapter 17, 2<sup>nd</sup> edition</li> </ul>	<ul style="list-style-type: none"> <li>Discussion 11: CO<sub>2</sub></li> <li>Quiz 12</li> </ul>

13	<b>Module 13 - Africa, US, and World: Invasive US Rodents and Global Diseases</b> <ul style="list-style-type: none"> <li>Rodents and Other Vertebrate Invaders in the United States</li> <li>Global Threats from Exotic Diseases</li> </ul>	<ul style="list-style-type: none"> <li>Pimentel Chapter 16, 2<sup>nd</sup> edition</li> <li>Pimentel Chapter 18, 1<sup>st</sup> edition</li> </ul>	<ul style="list-style-type: none"> <li>Turn in Citrus Greening Training Module (graduate students only)</li> <li>Discussion 12: Ebola</li> <li>Quiz 13</li> </ul>
14	<b>Module 14 – IFAS Weed Risk Assessment Discussion and Review for Comprehensive Final Exam</b> <ul style="list-style-type: none"> <li>Discuss results for Weed Risk Assessment report</li> </ul>		<ul style="list-style-type: none"> <li>Complete Course and Instructor Evaluation</li> </ul>
15	<b>Module 15 – Reading Days</b> <ul style="list-style-type: none"> <li>Reading Days</li> </ul>		<ul style="list-style-type: none"> <li>Complete Course and Instructor Evaluation</li> <li>Comprehensive Final Exam</li> </ul>

**Disclaimer:** This syllabus represents current course plans and objectives. As we go through the semester, those plans may need to change to enhance the class learning opportunity. Such changes, communicated clearly, are not unusual and should be expected.

## COURSE POLICIES

### Attendance Policy

This is an online class. Students are, therefore, required to view the weekly narrated lectures and the associated readings each week. You will NOT be allowed to take the exam after the exam date ***unless prior arrangements have been made***. Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

### Course Requirements

There are 4 examinations, 12 graded discussions, 13 quizzes, and 2 written assignments to complete the course requirements (weed risk assessment report, required for all students; and the citrus greening module, required for graduate students only).

### Examinations

There will be 4 Exams; the first 3 are divided by course content, while the 4th would be a comprehensive final. All examinations will be 50 questions, multiple choice, and each is worth 100 points.

- Exam 1: Modules 1 through 4
- Exam 2: Modules 5 through 8
- Exam 3: Modules 9 through 11
- Exam 4: Modules 1 through 13: Comprehensive Final

Each exam will be made available and accessible in Canvas from 8:00 am EST on Friday to 11:59 pm EST on Saturday of the exam week. You must have a Gatorlink account to access the exams. The exams will be proctored using HonorLock. The computer being used must have a camera and no outside materials or notes are allowed during the exam. The exams are closed-book. There is a time limit for the exams, and once you begin the exam, you will have 60 minutes to complete it in a single session, so do not open the exam until you are ready to complete it. On average, the exams take about 50 minutes to complete. Grades will be posted immediately following the exam using the e-learning grade book

### **Quizzes**

There are 13 quizzes (5 points each) throughout the course. The quizzes will consist of 5 multiple choice questions. The quizzes will be made available and accessible in Canvas from 8:00 am to 11:59 pm EST on Friday of the quiz week. Once you begin the quiz, you will have 5 minutes to complete it in a single session, so do not open the quiz until you are ready to complete it.

### **Discussions**

There are 12 discussion assignments (5 points each) throughout the course. All students are required to respond to the prompts provided for the weekly discussions. Students must cite the sources for the facts they use to support their reasoning. There must be at least one citation from peer-reviewed literature outside class modules or notes. Students may, in addition, cite educated and reliable sources such as opinions, technical reports, websites, and press releases to support their reasoning. Students are also required to respond to at least one of the posts made by other students in the course for each discussion. Each discussion assignment will be open for one week.

### **Weed Risk Assessment Report**

All students are required to fill in the columns (Y/N/UNK) to the best of their ability, provide resources for their answer in the "Resources" column, and provide the excerpt of data from the source in the "Source Data" column. After receiving the score which should auto-complete in the Excel spreadsheet, students should write in the "More Info" box whether they should accept, reject, or study further based on that score. Additionally, a sentence or two should be written to support or explain this answer.

### **For Graduate Students ONLY:**

Graduate students are required to complete the Citrus Greening Training Module. The instructor or the TA will provide more information.

### **Extra Credit**

There is no extra credit offered for the course, but the points for the Discussion posts do add up. Students are advised to submit posts even if they are late for at least a few points. Late submissions will be marked down by 0.5 points for each late day of submission.

## GRADING POLICIES

The course grade is based on performance on the exams, quizzes, participation in discussion activities, and the written assignments. The final grade points will be converted to percentages. The final grade will be assigned as follows:

Course Requirements		Undergraduate		Graduate	
		Point Value	Total Grade Points	Point Value	Total Grade Points
Discussions		12 each	60	12 each	60
Quizzes		13 each	65	13 each	65
Exams		100 each	400	100 each	400
Written Assignment (Graduate Students only)	UF/IFAS Assessment of Non- Native Plants	50	50	50	50
Written Assignment (Graduate Students only)	Citrus Greening Module	n/a	n/a	50	50
<b>Total</b>			<b>575</b>		<b>625</b>

### Grading Scale

Grade	Percentages
A	93 - 100
A-	90 - 92.9
B+	87 - 89.9
B	83 - 86.9
B-	80 - 82.9
C+	77 - 79.9
C	73 - 76.9
C-	70 - 72.9
D+	67 - 69.9
D	63 - 66.9
D-	60 - 62.9
E	<59.9 and below

### Online Course Evaluation Process

Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. These evaluations are conducted online at <https://evaluations.ufl.edu>.

Evaluations are typically open for students to complete during the last two or three weeks of the semester; students will be notified of the specific times when they are



open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results>.

## UNIVERSITY OF FLORIDA POLICIES AND ASSISTANCE

### Grades and Grade Points

For information on current UF policies for assigning grade points, see <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

### Academic Honesty

The university requires all members of its community to be honest in all endeavors. Cheating, plagiarism, and other acts diminish the process of learning. When students enroll at UF, they commit themselves to honesty and integrity. Your instructor fully expects you to adhere to the academic honesty guidelines you signed when you were admitted to UF.

Plagiarism is the use of ideas or writings produced by someone else. You should not use the writings of another person, including material from the internet (WWW), without putting the ideas in your own words, or placing the copied material in quotes and attributing authorship. In the scientific literature, quotations are rarely used. You should use your own words for answering questions on exams, and in your class project.

As a result of completing the registration form at the University of Florida, every student has signed the following statement:

*"I understand the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University. "Furthermore, on work submitted for credit by UF students, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment."*

It is to be assumed that all work will be completed independently unless the assignment is defined as a group project, in writing by the instructor. This policy will always be vigorously upheld in this course.

Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to the appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code>

## **Software Use**

All faculty, staff, and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

## **Services for Students with Disabilities**

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation 0001 Reid Hall, 352-392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/)

## **Campus Helping Resources**

Students experiencing crises or personal problems that interfere with their general wellbeing are encouraged to utilize the university's counseling resources. The Counseling Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal or lacking clear career and academic goals, which interfere with their academic performance.

- The University Counseling and Wellness Center, 3190 Radio Road, 352-392-1575  
[www.counseling.ufl.edu](http://www.counseling.ufl.edu)
  - Counseling Services
  - Groups and Workshops
  - Outreach and Consultation
  - Self-Help Library
  - Wellness Coaching
- U Matter We Care, [www.umatter.ufl.edu/](http://www.umatter.ufl.edu/)
- Career Resource Center, First Floor JWRU, 392-1601, <https://career.ufl.edu/>